

“People Oriented” Planning and Architectural Design Practice of Primary and Secondary Schools

Fangxin Ouyang*

School of Civil Engineering and Architecture of Wuhan Polytechnic University, Wuhan, Hubei, China

**Corresponding author. Email: 3461773@qq.com*

ABSTRACT

Based on some thoughts on the planning and architectural design of modern primary and secondary schools, taking the planning and architectural design scheme of Wuhan Huangshihai School as an example, the project background is briefly expounded, the main design ideas and characteristics are mainly introduced and some thoughts on the relationship between architecture and nature in the epidemic environment are put forward. The problems in terms of the overall layout, monomer design, function division, architectural boundary, student experience and so on are discussed, so as to prospect the modern campus design and create a new scene beyond the tradition.

Keywords: *Primary and secondary schools, Campus planning, Architectural design, Spatial boundary.*

1. PROJECT BACKGROUND

1.1. Site Conditions

The project is located in Dongxihu District, Wuhan City, Hubei Province. The proposed Huangshihai School is a nine-year system school with a net construction area of 86.4 mu (an average area of 20.4 m² per student), including primary and secondary schools. The site is adjacent to Jinshan Avenue in the south, Haicheng 7th Road in the East, Luocheng Road in the north and a large area of water Huangshihai in the west. There is a general hospital (i.e. Wuhan Taikang Hospital) in the southwest corner of the site. Due to the surrounding road conditions, the base is irregularly shaped and divided into two parts, east plot and west plot, by a municipal-planned north-south road. There are a large number of residential areas around it, and there is a supporting kindergarten in the residential area near the north side of the base, far away from the nearby primary and secondary schools. The base is far away from the central urban area with fewer subway lines around, but is closely connected with surrounding residential areas, so that it can meet the educational needs of surrounding residential areas and facilitate the activities of citizens.

1.2. Design Requirements

It is proposed to open thirty-six classes for the primary school, i.e. six classes for each grade from

grade one to grade six. It is expected to accommodate 1,620 students at a rate of 45 students per class. It is necessary to newly add a building area of 14,580 m² at the rate of 9 m² per person. It is proposed to open twenty-four classes for the secondary school, i.e. eight classes for each grade from grade seven to grade nine. It is expected to accommodate 1,200 students at a rate of 50 students per class. It is necessary to newly add a building area of 13,800 m² at the rate of 11.5 m² per person. The ground building area is about 40,000 square meters, with the newly built buildings including teaching buildings, comprehensive buildings in science and technology, administrative complex buildings, libraries, academic reporting halls, gymnasiums, student canteens, etc. in primary and secondary schools.

In the whole design planning, the position between each functional area and the building should be distributed according to local conditions, and the logic rationality and originality should be followed. The relationship between the degree of comfort and the distance of the user movement in the whole area should be fully considered to maximize the utilization of each building. In the design, the emphasis should be put on the space requirement of “teaching” and “learning”, so as to try to provide opportunities and places for the full and rich level of communication between students and teachers, as well as students and students. The parking space for motor vehicles and non-motor vehicles should be reasonably set up, and some parking space should be

open to society under the premise of satisfying the internal management of the schools.

2. DESIGN IDEAS

2.1. Preliminary Design Concept

The traditional decentralized layout of the campus is broken to apply the mixed layout to the teaching space, professional classroom, classroom office, comprehensive classroom and activity space. The public activity space is used for connecting all parts in series to form a variety of places for children to communicate, move and rest in a space rich in change. The activity types and node spaces which are different from that of the traditional teaching buildings are created to achieve the effect of teaching through lively activities.

In architectural design, the boundary between the ground and the roof is eliminated. A continuous roof space is created and the divided plots are organically connected. Space is created by starting from the ground on one side of the base and continuing to the roof in the form of a gentle slope, passing through the middle municipal road and reaching the land block on the other side, and continuing to extend downwards by the continuous roof to reach the ground. Thus a continuous and complete flow line is formed from the ground to the roof and from the roof to the ground. Moreover, this is a good connection between two plots separated by municipal roads.

2.2. Some Thoughts on Epidemic

Whether the flow line of the campus complex is easy management. All functions are integrated to eliminate the boundary and distance between the functions. It seems that the accessibility and accessibility of each function space are fully satisfied, and the independence of each function is easily influenced. When one functional area needs to be closed or otherwise processed, the other functional areas can be greatly influenced. That is to say, it is difficult to form closed and partitioned management.

The erosion of outdoor activity space by campus complex. The complex will bring a kind of "indoor feeling" to a large extent, which will often increase the depth of architectural scale, so that the ventilation and lighting in the middle part are affected. Besides, there are many common techniques to improve the architectural design, such as adding the atrium space reasonably, lighting with skylights, and forming outdoor terraces with partial excavations. But for a long time of enclosure during the epidemic period, it may also be very important to have an outdoor life of "expose to the weather". It should take a lot of time to run outside and feel the natural power while providing an outdoor activity space for uncomfortable weather.

2.3. Final Design Concept

Based on some thoughts on the design of primary and secondary schools during the epidemic period, the original idea of designing a school complex is changed, but some design ideas are still retained and updated:

The decentralized layout is adopted. Although the decentralized layout is adopted, the number of buildings can be reduced under the condition that each function can be reasonably partitioned, and at the same time, the connection between buildings should be strengthened. There are a variety of techniques that can be used to enhance connection, such as corridors, flyovers, or even underground structures.

The continuous roof ramp is adopted. The idea of eliminating the boundary between the ground and the roof is retained, but changed. Instead of integrally connecting the two sides of the base, this concept is applied to the monomer design of the primary school, which is more suitable for the corresponding users.

Thus, a sense of inward-facing and outward-facing is created. The sense of inward-facing comes from the inner courtyard or atrium, enclosed by the building volume to form the centrality. Different sizes of courtyards or different degrees of the enclosure are adopted for different types of buildings to achieve different degrees of centrality. The sense of outward-facing comes from the more open and less enclosed space, such as the outdoor balcony, roof deck and even outdoor activity space. The sense of inward-facing space is suitable for staying, while the outward-facing space is suitable for more dynamic activities.

3. DESIGN RESULTS

3.1. Site Design and Functional Layout

The number and orientation of the openings are determined. Firstly, the entrance and exit needed to be set can be defined, so that people and vehicles can be separated, students and office logistics should be reasonably separated, and the entrance and exit needed to be opened to external personnel should be set in consideration of the opening-up of the campus. Because the flow of people is too large during the rush hour and all of them are students, the main pedestrian entrance and exit should not be set at the main roads and intersections. The main entrance should be preferably set on the north side of the base, which has little interference to the road and is closely connected with the residential area on the north side. The lane entrance and exit should also keep some distance from the intersection of the urban road, and should not keep the distance of less than 70 meters from the intersection of the urban trunk road since the red line of the road. The

other entrances and exits should be set according to the functional layout without causing flow line crossing.

The functional layout is determined. In order to avoid the interference of roads and vehicles on students, the most open sports field is placed in the southwest corner of the site. In combination with the sports field, a small piece of plot on the west side of the sports field can be set as a gymnasium. In addition, a secondary entrance and exit can be set on the north side to open the sports area to external personnel. After the 400-meter runway is set according to the condition of the base, the site is not redundant, and the buildings are set on the north side of the vacant site in a centralized way. According to the area proportion of the primary school and the secondary school, the primary school is set at the west side of the base, which is convenient for the secondary school students who often use the sports field. The complex building is set independently between the secondary school building and the sports field, so that some noise on the sports ground can be isolated on the one hand, and some internal stands can be built according to the complex building on the other hand. The administrative building is set independently and outwards to some extent, so it is set near the entrance on the west side of the base.

3.2. Single Building - A Case Study of the Monolithic Building in the Primary School

3.2.1. Function and Flow Line Design

Due to the decentralized layout of the whole campus, the function of the single unit of the primary school department is relatively single, so the main requirement is to set 36 classes (6 classes per grade), and the corresponding auxiliary functions, such as a small office space, a toilet, a lounge, etc. A large area of overhead space is set on the first floor to provide a semi-outdoor space. Besides, it can close when necessary.

In order to facilitate the management, each grade should be arranged in different layers, and should not be arranged crosswise. Six classes for each grade should be arranged in a centralized way. Men's and women's toilets need to be set up on every floor. In addition, classroom offices can be set up on each floor to facilitate the communication between students and teachers, as well as the management and care of students by teachers, so as to avoid accidents.

The flow line is also relatively simple due to the single nature of the functions. The single building is closely connected with the site and directly connected with the main entrance square. After entering the inner courtyard of the single building, the floors of different grades can be reached through vertical traffic.

3.2.2. Lighting and Ventilation Design

There is a 64-metre-high hospital on the south side of the primary school building, but it is far away, and basically has no impact.

The classroom with high lighting requirements should be reasonably arranged to provide the appropriate light. The shape of the building is approximately rectangular ambulatory-plane. The volume of classrooms is arranged in the north-south direction, and the volume of auxiliary rooms with low lighting requirement is arranged in the east-west direction. The windows of most classrooms can be directly opened on the south side, and the windows of a small number of classrooms can be opened on the north side, but a single corridor design is adopted for all classrooms, so the windows can be opened on the corridor side to bring better light to the classrooms. In addition, considering the hot summer in Wuhan, concave or convex sunshade is adopted in the south so as to avoid direct sunlight and reduce indoor heat.

The first floor of the building is partially overhead, combined with the atrium space, so that air can circulate from bottom to top, cold air is brought into the interior of the building, and heat generated by the atrium and the heat rising to the top floor are taken away, thus reducing the temperature of the whole building and achieving a more comfortable thermal environment. In addition, the air inside the building can be circulated and the air quality can be improved.

3.2.3. Activity Space Design

Three kinds of main activity space are formed according to the combination of form and the distribution of functions.

The first is to combine with the form, as mentioned repeatedly before, to eliminate the boundary between the ground and the roof. An annular flow line is formed from the ground to the fourth-floor roof, from the fourth-floor roof to the second-floor roof, and then to the ground. The flow line is developed in the vertical direction, which is different from the flow line developed in the horizontal plane, and particularly conforms to the tedious psychology of children, with rock climbing feeling in the walking process, so as to add a lot of fun. Due to the randomness of the rising surface, each slope is different in gradient, so children can give full play to their imagination and release their vitality here.

The second is two inward-facing courtyards surrounded by an annular flow line. The two courtyards are provided for relatively centralized outdoor activity space, connecting with the site outside the building. Compared with the activity space outside the site, they have certain introversion, thereby generating a sense of

belonging and safety. The courtyards are mainly afforested, so that green is added to the study life, improving the air quality on one hand, and relaxing the mood and relieving the visual fatigue on the other hand.

The third is the activity space distributed on each floor. Although the building is not high, it still needs to meet the demands of classroom activities on each floor. For example, the third floor is relatively far away from the ground, so more activity space should be arranged on the third floor than on the second floor. On the third floor, there is a ramp that leads directly to the activity space on the first floor, and also leads directly to the roof. Let the children on each floor have enough activity space.

The building provides a plurality of choices through different combinations. There are sites suitable for different time periods, different weathers, and students with different personalities.

4. CONCLUSION

There are still some shortcomings in this design. For example, the overall relationship is not well controlled in the process of deepening the form of the monomer building, so that the campus is relatively weak in the overall connection; the technique adopted is not mature enough. The architectural form of “7” and “8” (means that primary and secondary school students are like the sun at seven or eight o'clock) is originally adopted, but the form processing method adopted is too rigid; there are no further details.

In the development of modern architecture, the word “tradition” is often used to describe past buildings. What

attitude should we have towards traditional buildings? Is it a good building to take a different form from the traditional one? How to preserve the advantages of traditional architecture, incorporate the ideas and techniques of the new era into it, and adapt to the modern environment of the era may be a question worth thinking about. The school building is like the carrier of education, providing an educational environment and playing the role of building in education.

REFERENCES

- [1] Wang Mingjie, Wu Zhongping and Ma Chenlong. A Study on the Planning and Design of “Sponge Campus” Based on the Concept of Wetland Ecology [J]. *Architecture and Culture*, 2020
- [2] WANG Jing. A study on architectural design of middle and primary schools in new age [D]. Hebei University of Technology, 2014
- [3] (America) Michael J. Crosble, translated by LU Junwei et al. *Class Architecture* [M]. Dalian University of Technology Press, 2004
- [4] ZHANG Zongyao. *Architectural Design for Middle and Primary Schools* [M]. China Building Industry Press, 2008
- [5] LIANG Guoli. What’s a 3.0 school [J]. *Teacher’s Journal*, 2016, (14)
- [6] YANG Lili. New exploration of Green School—Seven Steps in Creating a Green School [J]. *The Science Education Article Cultures* (1st Ten-day), 2008, (08)